GAS LIGHTER

FIELD OF THE INVENTION

[0001] The present invention relates to gas cigarette lighters.

BACKGROUND OF THE INVENTION

[0002] More particularly, the invention relates to a gas cigarette lighter comprising: a fuel reservoir, preferably made of a rigid amorphous polymer material. The reservoir having a top wall through which a well passes, and a threaded ring screwed into a tapped portion of the well. The threaded ring preferably being configured to receive a gas dispensing device including at least one tubular element.

[0003] The above-mentioned amorphous polymers are polymers having chains of monomers disposed in disordered or random manner, unlike semi-crystalline or crystalline polymers, in which the chains are disposed uniformly. Certain amorphous polymers offer advantages for making fuel reservoirs for lighters, with particular examples worth mentioning being the categories of styrene acrylonitriles (SANs) or acrylonitrile butadiene styrenes (ABSs). Certain amorphous polymers are also transparent, which makes it possible to see the level of liquid fuel remaining in the reservoir. Amorphous polymers are also generally less expensive and easier to use than semi-crystalline polymers.

[0004] However, these amorphous polymers are relatively brittle at ambient temperature because their elongation at the elastic limit is small, generally less than 5%. That brittleness makes it nearly impossible to force-fit gas dispensing means into the well of the reservoir. Thus more complex fitting means must be used. For example, WO 01/18452 A1 discloses a gas dispensing device, comprising: a wick 27, a porous foam element 25, a tubular element 12, a threaded ring 11, and a bushing 13. The wick 27, which extends from the bottom of the reservoir 3 to the well in the top wall, feeds a "wetting" chamber with liquid fuel by capillary action; the porous foam element 25, which has a face in contact with the wetting chamber, allows the liquid fuel to evaporate; the tubular element 12, which is provided with an annular gasket 31, provides a certain degree of sealing between the well and the tubular element; the threaded ring 11, which is screwed into a tapped top portion lc of the well, receives the tubular element that compresses the foam element; and the bushing 13, which is generally made of brass is mounted to slide through the threaded ring, has a bottom portion that co-operates with the tubular element to form a valve for controlling the gas flow rate.

[0005] The main drawback of such a dispensing device however is that the foam element does not make it possible to provide a constant gas flow rate and thus a constant flame height. Rather, the gas flow rate varies in particular as a function of the internal pressure of the reservoir and with temperature. Thus the threaded ring of the prior art device must usually be provided with a manual control 37 so that the user can adjust the flame by compressing the foam element to varying extents. However, in the event that the flame height control is operated accidentally or involuntarily, as happens often with pocket cigarette lighters, the flame height can vary considerably.

SUMMARY OF THE INVENTION

[0006] The present invention provides a cigarette lighter with a tubular element that has a bottom portion that extends at least to the bottom end of the well.

[0007] The tubular element may also preferably receive a microporous membrane which provides a gas flow rate that is substantially constant. The microporous membrane forms a regulating device for controlling the gas flow rate, thus making it possible to provide a constant flame height. Such microporous membranes are preferably provided with pores whose size and angular positioning make it possible to regulate the gas flow rate with precision, regardless of whether the inside face of the membrane is in contact with the gas phase or with the liquid phase of the fuel. In addition, the small dimensions of these membranes facilitate miniaturization of the cigarette lighter. In addition, the relative positioning of the microporous membrane with the positioning of the bottom portion of the tubular element further contributes to providing a controlled flame height.

[0008] That is, during impact testing, the inventors of the present invention discovered that when the bottom portion of the tubular element was disposed in an intermediate position between the top end and the bottom end of the well, damage to the microporous membrane occurs more readily, leading to uncontrolled variations in flame height.

[0009] Such damage, which may take place when the reservoir is made of a rigid amorphous polymer appears during impact tests designed to simulate a lighter being dropped from a user's hand during use. In such cases, a shock wave is generated in the reservoir, and, because of the rigidity of the reservoir, the shock wave is transmitted in full to the top portion of the lighter and is channeled through the well to the microporous membrane.

[0010] The inventors of the present invention have observed that, surprisingly, such damage does not occur when the tubular element is positioned such that its bottom portion extends at least to the bottom end of the well.

[0011] In addition, it is optionally possible to use any of the following provisions singularly or in combination:

[0012] the tubular element passes through the threaded ring;

[0013] an annular sealing gasket disposed between the tubular element and the top wall;

[0014] the top wall may be provided with a radially extending rim against which the annular sealing gasket may be held in abutment by the threaded ring;

[0015] the tubular element may be made of metal;

[0016] the micro-porous membrane may be held against an internal shoulder in the tubular element by being pressed against a retaining ring, the tubular element having a bottom end crimped against the retaining ring;

[0017] the reservoir may include a bowl having a top end to which the top wall may be bonded; and

[0018] the reservoir may be formed by a material chosen from ABSs or from SANs.

[0019] Other features and advantages of the invention will become apparent to those skilled in the art during the description which will follow, given by way of a non-limiting example, with reference to the appended drawing.

BRIEF DESCRIPTION OF THE DRAWING

[0020] Figure 1 is a vertical cross sectional view of a top portion of a cigarette lighter

DETAIL DESCRIPTION OF THE PREFERRED EMBODIMENT

[0021] For the purpose of promoting an understanding of the principles of the present invention, reference will now be made to an exemplary, non-limiting embodiment illustrated in Fig. 1. As shown, the gas lighter 1 comprises a reservoir 2 intended to contain a fuel under pressure, and, partially in the liquid phase, such as, for example, isobutane.

[0022] In the embodiment shown, the reservoir is formed of a bowl 3, the bowl 3 preferably being U-shaped in cross section, and having a bottom wall (not shown in the figure), and an annular side wall that extends upwards from the bottom wall to a top end 4.

[0023] The top end 4 may be closed off by a top wall 5 which, in the example shown, may be a separate part fixed to the bowl 3 by any method known in the art including, but not limited to bonding, gluing, welding, friction or press fit, etc. Alternatively, the top wall 5 may be manufactured as an integral part with the bowl 3.

[0024] The reservoir 2 is preferably manufactured from at least one rigid amorphous polymer material including, for example, acrylonitrile butadiene styrenes (ABSs), styrene acrylonitriles (SANs), etc. Alternatively, by way of example, the bowl 3 may be manufactured from SAN, and the top wall 5 may be manufactured from ABS, and vice-versa, it being possible, in known manner, to bond these materials together, for example by ultrasonic sealing, bonding, ultrasonic welding, gluing, etc.

[0025] As previously stated, the advantage of such rigid amorphous polymers is that they are relatively inexpensive, and easy to implement, process, manufacture, and form parts from. In addition, certain rigid amorphous polymers, such as SAN, may be transparent, making it possible for the cigarette lighter user to see the level of liquid fuel remaining in the reservoir.

[0026] Other amorphous-type polymers may also be used, provided that their mechanical and chemical properties are compatible with them being used as a gas lighter reservoir.

[0027] To accommodate the gas pressure prevailing inside the reservoir 2, the bowl 3 and the top wall 5 may have walls that are relatively thick, and the bowl 3 may optionally be provided with one or more bridges that extend vertically from the bottom wall while interconnecting two opposite faces of the side wall.

[0028] The top wall 5 preferably is provided with a well 6 that in the example shown, extends vertically and which may preferably be in the shape of a cylinder that is circularly symmetrical. The well 6 preferably being capable of receiving a gas dispensing device 10, which includes a tubular element 23 which is preferably made of metal and also in the shape of a cylinder that is circularly symmetrical.

[0029] The gas dispensing device 10 preferably is actuated by a control device 11 that is carried on the a head 12 of the lighter, the head of the lighter overlying the reservoir 2 as shown. Preferably, as shown the head 12 is retained against the top wall 5 of the reservoir by catches 20 (*i.e.*, studs) on the head 12 that cooperate by snap-fastening or clipping with complementary catches 21 molded in the top wall 5 of the reservoir 2.

[0030] The head 12 may also form a support for fitting an ignition device 14 and a windshield 13 forming a screen or shield against the wind or drafts. The ignition device 14, which are generally widely known in the art, may comprise, for example, a serrated friction

wheel 15 and a flint 16 held pressed against the serrated friction wheel 15 by a spring 17 received in a circular cup 18 in the head 12. A complementary cavity 19 is formed in the top wall 5 of the reservoir 2 to accommodate the cup 18 of the head 12. However, it is of course possible to use other types of ignition devices, such as a piezoelectric device, etc.

[0031] Preferably the present invention further comprises a threaded ring 7, which may be screwed into the well 6, preferably into a tapped portion 8 of the well 6. As shown, preferably the threaded ring 7 is screwed into the top portion of the well 6.

[0032] Preferably, the threaded ring 7 is capable of receiving a tubular element 23. The tubular element 23 may be fitted to the threaded ring 7 by any method known in the art. However, it is preferred that the threaded ring 7 and the tubular element 23 be fitted therein by force or press fitting so as to provide good sealing and to ensure that the tubular element 23 is held stationary relative to the threaded ring 7.

[0033] Furthermore, a microporous membrane 25 is preferably disposed within the bottom portion 24 of the tubular element 23. The microporous membrane 25 provides a constant gas flow rate. This microporous membrane 25 preferably is manufactured by a uniaxially stretched polypropylene film provided with slot-like pores, as described in United States Patent No. 4,496,309.

[0034] Preferably the bottom portion 24 of the tubular element 23 extends below the bottom end 6a of the well 6. As shown, the bottom portion 24 extends about 1 millimeter (mm) below the bottom end 6a of the well 6, however, it should be noted that this dimension may vary, and that it may be sufficient for the bottom portion 24 of the tubular element 23 to be flush with the bottom end 6a of the well 6 to avoid damaging the microporous membrane 25 in case the lighter is accidentally dropped.

[0035] Surprisingly, extending the bottom portion 24 of the tubular element 23 so that it is at least flush with the bottom end 6a of the well 6 makes it possible to avoid damage to the microporous membrane 25 when the lighter is dropped from a substantial height onto a hard floor. This is in contrast with previous devices where the bottom portion 24 of the tubular element 23 terminates at a point inside the well 6, (*i.e.*, above the bottom portion 6a of the well 6) which typically results in the microporous membrane 25 being damaged and even possibly rupturing in some cases when dropped from substantial heights.

[0036] It should be further noted that the cavity 19 in the top wall 5 may extend towards the inside of the reservoir 2 without modifying the resistance to impact of the microporous membrane 25.

[0037] Preferably, the microporous membrane 25 is held against an internal shoulder 26 of the tubular element 23, the shoulder 26 being formed in the vicinity of the

bottom portion 24 of the tubular element 23. The microporous membrane 25 covers an orifice 27 formed in the center of the shoulder 26. The microporous membrane 25 is preferably pressed against the bottom face of the shoulder 26 by a retaining ring 28, which is itself retained at the bottom portion 24 of the tubular element 23 by crimping the lower end of the bottom portion 24 of the tubular element 23.

[0038] The dispensing device 10 preferably also includes a valve having a gas outlet duct 33 opening near the ignition means 14. The valve being formed by a tubular hollow body 31 which, in its bottom portion, preferably carries closure means such as an elastomer disk 32 adapted to shut off the above-mentioned gas passage orifice 27 as the duct is moved along the longitudinal axis of the tubular element 23. The hollow body 31, which defines the gas outlet duct 33, communicates with the inside of the tubular element 23 via slots 34, etc. provided in the hollow body.

[0039] The hollow body 31 has an outside wall that preferably extends along most of the inside wall of the tubular element 23 in order to limit gas losses when the valve is opened. Furthermore, it should be noted that the tubular element 23 preferably passes right through the threaded ring 7 in order to increase the axial length of the outside wall of the hollow body 31 that is in contact with the inside wall of the tubular element 23.

[0040] Preferably, the lighter also includes a control device 11. The control device 11 includes a fork 35 mounted to tilt about a pin integrally secured to the head 12. The fork having a first end 36 and a second end 38. The first end 36 of the fork cooperates with a setback 37 formed on the top portion of the hollow body 31 which emerges from the tubular element 23 thus permitting the gas dispensing device 10 to be raised as the user depresses the second end 38 of the fork. . When the user depresses the second end 49 of the fork raising the hollow body 31, the valve is opened releasing gas from the reservoir 2.

[0041] Preferably, , a compression spring 39 is disposed between the bottom face of the second end 38 of the fork and the top wall 5 of the reservoir 2, thus biasing the fork upwards and hence the valve into a closed position when the lighter is not in use..

[0042] Finally, the lighter may also include an annular gasket 41disposed between the tubular element 23 and a portion 42 of the top wall 5. The portion 42 of the top wall 5 receiving the annular gasket 41 is preferably smooth. The quality of the surface state of the portion 42 of the top wall 5, and the quality of the material used for the annular gasket 41 may be chosen such as to obtain satisfactory sealing for the reservoir 2.

[0043] In addition, the annular gasket 41 may be held in position by a radially extending rim 43 formed on the top wall 5 and by the threaded ring 7. However, the annular gasket 41 should not be pressed hard against the rim 43, in order to avoid the

appearance of cracks in the top wall 5 of the reservoir 2.The present invention has been described in connection with the preferred embodiments. These embodiments, however, are merely for example and the invention is not restricted thereto. It will be understood by those skilled in the art that other variations and modifications can easily be made within the scope of the invention as defined by the appended claims, thus it is only intended that the present invention be limited by the following claims.